Self Adaptation for Security Monitoring in IaaS clouds

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Context: IaaS cloud environments.
Frequent infrastructure-related changes:
- VM creation, migration, destruction
- Service addition or removal

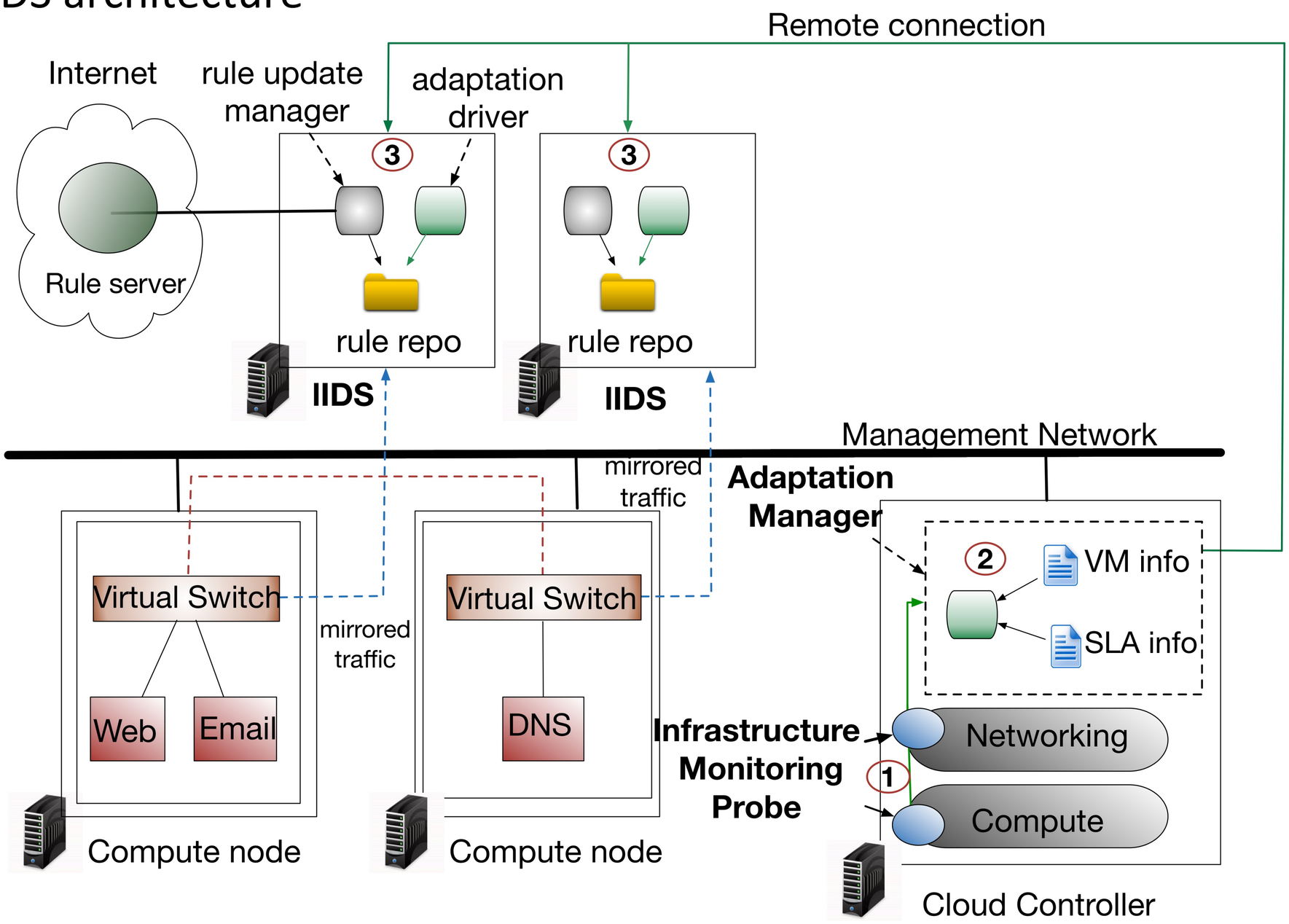
Problem: Frequent changes make traditional security monitoring fail

Related work: Projects that partially address tenant driven customization and scalability issues [1][2] but fail to adapt to frequent changes. [3] addresses self-adaptation but not multi-tenancy, tenant-driven customization or cost-effectiveness.

[1] S. Roschke et al. Intrusion Detection in the Cloud. In Proc. DASC 2009
[2] C. Mazzariello et al. Integrating a network IDS into an open source Cloud Computing environment. In Proc. IAS 2010
[3] A. Wailly et al. VESPA: multi-layered self-protection for cloud resources. In Proc. ICAC 2012

Objectives	**Self adaptability:** react to changes in virtual and physical infrastructures	**Customization:** allow tenants to request detection of specific types of attacks	**Scalability:** adapt to traffic load and changes in the size of the infrastructure	**Cost minimization:** for tenants and the provider
SAIDS Features	**Adaptation probes:** detect a change and reconfigure the components involved	**Customized rules:** include IDS rules targeting a tenant's deployed services	**New sensor deployment:** rebalance traffic analysis when a local intrusion detection sensor is overloaded	**Component sharing:** tenants may share local IDS sensors

SAIDS architecture



1. **Infrastructure monitoring probes** notify the adaptation manager that a topology change occurs and relate the necessary information: VM id, VM IP, hostname of physical host
2. **Adaptation manager** decides which additional rules have to be activated in the **local IDS** (IIDS) responsible for the new host of the VM.
   Decision based on:
   - Deployed services (VM info)
   - Specific requests from tenants (SLA info)
3. The adaptation manager adapts the IIDS through remote execution of the adaptation driver

Early evaluation

Goals

Evaluating the reconfiguration overhead & quality of detection

Technologies

- Cloud deployed with Openstack
- Inter VM communication through GRE tunnels on Open vSwitch

Scenario

- Load balanced setup representative of a production env.
- 3 interconnected VMs: web, mail, DNS services
- 2 IIDSs: one per virtual switch

Future Work

- Combine monitoring for provider and tenants
- Add other devices: collectors, aggregators
- Offer tenants partial control of the framework

Results